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It is to be noted that even these selected records vary a hundred per cent. Very notable variations are found in the same mine or well, and often much difference is found in adjacent records, especially those of artesian wells. Some of these are explainable, but the full meaning of other variations is yet to be found.<sup>15</sup>

In conclusion, it may be stated that from recent figures bearing on this subject, no general law is observed in the increase of rock temperature with depth, and in general the increment of heat is lower and more variable than indicated by the earlier observers.

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#### THE SCALES OF THE DIPNOAN FISHES

I AM greatly indebted to Dr. G. A. Boulenger for scales of the few living members of the very interesting and remarkable subclass known as Dipnoi or Dipneusti. The result of their examination is quite surprising to me, and has, I think, an important bearing on their relationship with other fishes.

*Neoceratodus forsteri*, from Queensland, has very large oblong scales, one before me being 55 mm. long and 34 mm. broad, 20 mm. or less of the length being exposed in the living fish. In general appearance, the scales are not unlike those of *Heterotis*, except for size. The broad nuclear field, far apicad of the middle, is rugose; the circuli (fibrillæ) are all very fine, and both basal and apical are longitudinal; the basal fibrillæ are moniliform (minutely tuberculate), and in the lateral fields the whole surface is minutely rather irregularly tuberculate. Thus in its longitudinal fibrillæ *Neoceratodus* agrees with *Amia* and *Albula*; in having the fibrillæ tuberculate or beaded it agrees with *Albula* and the Osteoglossidæ. At first sight it seems that there are no radii in *Neoceratodus*, but closer inspection shows a complete system of fine radial reticulations, especially well developed in the lateral areas, where it accords perfectly with the network pattern of the Osteoglossidæ! This exceedingly characteristic fea-

ture is now known, therefore, in the Dipnoans, the Osteoglossids and the Mormyrids.<sup>1</sup>

Having determined these facts, I turned with eagerness to the material of *Lepidosiren* and *Protopterus*. In these fishes the scales are completely enclosed in the skin, but are, nevertheless, quite large (fully 8 mm. diameter in *Protopterus*), and shaped much as in *Osteoglossum*. Both have a strong radial network, while the circuli are reduced to innumerable fine tubercles or coarse granulations, approaching the condition of the lateral areas in *Neoceratodus*. *Protopterus annectens* from Africa (Gambia) and *Lepidosiren paradoxus* from Brazil have scales of entirely the same type, but in the *Protopterus* the network is more regular and more obviously similar to that of the Osteoglossids. In both the fibrillar granulations tend to run in lines near the margin, but this is rather more marked in *Lepidosiren*; the indications are in each case of longitudinal (not circular) fibrillæ. The general results may be thrown in the form of a table, thus:

- (A) Basal fibrillæ longitudinal.
- (a) Fibrillæ moniliform or tuberculate.
  - (1) With radial network ... Dipneusti.
  - (2) Without radial network.
- Albula* and *Dixonina*.
- (b) Fibrillæ not tuberculate; no radial network .... *Amia calva*, *A. scutata*.
- (B) Basal fibrillæ circular (normal circuli); radial network present.
- (a) Fibrillæ tuberculate .... Osteoglossidæ.
- (b) Fibrillæ not tuberculate ... Mormyridæ.

It is also to be remarked that *Gymnarchus* (Mormyridæ), *Heterotis* (Osteoglossidæ), *Lepidosiren* and *Protopterus* all have larvæ with external gills.

Dr. Boulenger has very kindly sent me the scales of the Osteoglossids *Scleropages formosus* from Borneo, *Scleropages leichardti* from Queensland and *Osteoglossum bicirrhoum* from Cadajos, Brazil. They are practically circular (*S. leichardti* rather broader), and all have exactly the same structure, notwithstanding the wide geographical separation. The scales of *Heterotis niloticus* differ

<sup>1</sup> For the last, see Smiths. Misc. Coll., Vol. 56, No. 3, p. 2.

<sup>15</sup> *Op. cit.*, pp. 543-544.

in being oval. *Pantodon* (fam. Pantodontidae) also has strongly tuberculate basal circuli.

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*SOCIETIES AND ACADEMIES*

THE NEW YORK ACADEMY OF SCIENCES  
SECTION OF BIOLOGY

THE regular monthly meeting of the Section of Biology held at the American Museum of Natural History, March 13, 1911, was devoted to a public lecture by Dr. George A. Soper, president of the Metropolitan Sewerage Commission, on the "Scientific Aspects of the Work of the Metropolitan Sewerage Commission."

In connection with the investigations of the commission upon the pollution of the waters of New York harbor from various sources, a great amount of scientific work has been done by Dr. Soper and his assistants. The most interesting features of this work and its results were dwelt upon in popular manner by the lecturer.

AT the regular monthly meeting of the section held at the American Museum of Natural History, April 10, 1911, Chairman Frederic A. Lucas presiding, the following papers were read:

*A New and Peculiar Porpoise from Japan:* Roy C. ANDREWS.

The speaker exhibited photographs and parts of the skeleton of a new porpoise secured in the summer of 1910, in Rikuzen province, Japan. This specimen is allied to *Phocæna dalli* True, and with that species forms a distinct group of *Phocæna*-like porpoises which deserves generic rank. This group resembles *Phocæna* externally, but has white side and ventral areas sharply defined from the black of the upper parts, a falcate dorsal fin, and vertebræ numbering 95 or more. The type of the new genus to which *Phocæna dalli* was referred is the specimen which was secured in Japan, and has been formally described in a *Bulletin* of the American Museum of Natural History, now in press.

The Japanese porpoise presents characters, both externally and in the skeleton, which distinguish it from all other members of the entire family. The caudal peduncle shows a strongly marked "hump," and ventrally a prominent concavity which gives the posterior portion of the body a most extraordinary appearance. The neural spines of the entire vertebral series are extremely long and slender, reaching a height much greater than in any other known member of the Del-

phinidæ. The transverse processes are also very long and rod-like. The number of vertebræ is 95, approaching closely *P. dalli*, which has 97. The scapula is unlike that of any other member of the family in that its height almost equals its greatest breadth, and it is in general shape somewhat like that of a Baleen whale.

The specimen is, on the whole, one of the most remarkable members of the Delphinidæ that have thus far been discovered.

*Observations on Birds and Fishes made on an Expedition to Florida Waters:* J. T. NICHOLS.

This paper concerned itself with a trip through Florida waters on Mr. Alessandro Fabbri's yacht *Tekla* in the interests of the American Museum's department of fishes.

Attention was called to the abundance of the white ibis and Louisiana heron, contrasted with the scarcity of aigrette-bearing herons. After a brief mention of the work and the results obtained, the balance of fish-life in a fresh-water outlet of the everglades was compared with the balance of fish-life in the salt water as at Key West.

In the former situations gar pikes (*Lepisosteus*) were abundant, as were various Centrarchids (among them the large-mouthed bass and blue-gill sunfish) which darted in and out through the little channels among the weed, but which did not drive head first through the masses of weed as did the leathery-skinned gars, and only made quick sallies into the shallower and less open waters, where various species of Pœciliids, especially *Gambusia*, and *Fundulus goodei* were tremendously abundant. The surprising freedom from mosquitoes was mentioned and it was pointed out how the existing balance of fish-life was favorable to a great abundance of *Gambusia*, etc., which might be expected to prey on mosquito larvae. The Centrarchids would be likely to hold in check a fish like the banded pickerel, which would have followed these small fishes into the shallows where the Centrarchids did not follow them, and perhaps materially reduced their numbers. The situation here where the large primitive gar, the spiny-rayed modern Centrarchids and the abundant intermediate Pœciliids made up the bulk of the fish population, was compared with the more complicated marine situation where large selachians and spiny-rayed basses, snappers, grunts, wrasses, scorpion fishes, etc., and schooling herrings and anchovies of various sorts in a way constituted homologous classes.

L. HUSSAKOF,  
*Secretary*